NUI Galway
OÉ Gaillimh

Semester 1 Examinations 2016/ 2017

Exam Code(s)	4BCT1
Exam(s)	4th Year Examination Computing Science and IT
Module Code(s)	CT421
Module(s)	Artificial Intelligence
Paper No.	1
Repeat Paper	No
External Examiner(s)	Dr. John Power
Internal Examiner(s)	Dr J Duggan *Dr. C Mulvihill *Dr. F Smith

Instructions: Answer 2 questions from each section. All questions will be marked equally. Use a separate answer book for each section.

Duration	2 hours
No. of Pages	4
Discipline(s)	IT
Course Co-ordinator(s)	

Requirements:

MCQ	Release to Library: Yes ☐ No ☐
Handout	None
Statistical/ Log Tables	None
Cambridge Tables	None
Graph Paper	None
Log Graph Paper	None
Other Materials	None
Graphic material in colour	Yes ☐ No ☐

PTO

Section A

1

(a)

What are the differences between rules in Fuzzy Logic and rules used by conventional logic? (10 marks)

(b)

Give a worked example of fuzzification and defuzzification, explain the steps involved . (10 marks)

(c)

Could you encode conventional ‘crisp’ rules as fuzzy rule? Explain your answer. (5 marks)

2

a) Describe the differences between qualitative reasoning and quantitative reasoning.
(4 marks)

b) What are the assumptions that are made when using QSIM?
(3 marks)

c) Briefly describe how QSIM simulates the behavior of a physical system.
(10 marks)

d) i) How are values of variables represented in QSIM?
(4 marks)
ii) How are DERIV constraints applied in QSIM?
(4 marks)

3

(a)

(i) Describe Depth First Search with Iterative Deepening. (5 marks)
(ii) How efficient is Depth First Search with Iterative Deepening? (5 marks)

(b)

Describe the difference between Depth First Search and Breadth First Search, highlight the advantages and disadvantages of both of them.(10 marks)

(c)

Describe 5 different sources of uncertainty in reasoning. (5 marks)

Section B

4

(a) What do you understand by a ‘greedy searcher?’ (7 marks)

(b) Greedy searchers are often employed with graphs. Consider an undirected graph G that consists of six nodes (A-F) and six edges as follows: There is an edge between D and E. There is an edge between E and B. There is an edge between B and C. There is an edge between C and F. There is an edge between F and A. Find one ordering of the vertices where a greedy searcher will colour with two colours, and another where it will colour with three colours. Note: The conditions on the search are that connected nodes must have different colours and that the least possible number of colours is preferred (12 marks)

(c) You are told that in a search environment a heuristic h1 can be constructed which has the property that it always provides an estimate of distance to the goal that is less than the actual distance to the goal. Another heuristic h2 has the property that it always provides an estimate that is greater than the actual distance to the goal. Which would you prefer and why? (6 marks)

5

(a) In the context of genetic algorithms, explain what is meant by the term ‘roulette wheel selection’ (5 marks)

(b) A software bot (like Mitchell’s Robby) is to be developed for collecting bottles in a 10 by 10 two-dimensional array. A cell of this array can be empty or contain a bottle. In terms of context, a bot can see the contents of the current cell, and the contents of one cell north, south, east and west. In terms of actions, a bot can: Move one cell north, south, east, west, move one step randomly (north, south, east, or west), pick up a bottle in the current cell, or do nothing. A reward should be given if the bot picks up a bottle in the current cell. However a fine should be applied if the bot’s action is to pick up a bottle and there is in fact no bottle in the cell. Discuss the development of a suitable genetic algorithm for evolving this bot (12 marks)

(c) Suppose that a vase can be present in a cell and that the bot should not pick it up. Give any one way that you might modify your fitness function to take account of this new constraint, assuming that exactly one of the following events occurs: The cell is empty, the cell contains a bottle, the cell contains a vase (8 marks)

6

“Watson presents a vision of the future for Artificial Intelligence, and systems like Siri and Alexa represent the current state of AI, at least from the perspective of everyday personal assistants” Discuss this statement under the following three headings:

Current state of AI assistants (7 marks),

possible futures for AI assistants (10 marks),

current interest in the conversational user interface (8 marks)